



COASTAL MANAGEMENT FRAMEWORK REPUBLIC OF THE MARSHALL ISLANDS



PRODUCED BY RMI EPA
COASTAL AND LAND MANAGEMENT DEPARTMENT
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RMI COASTAL MANAGEMENT NATIONAL FRAMEWORK

PREPARED BY

COASTAL AND LAND MANAGEMENT DEPARTMENT

RMI ENVIRONMENTAL PROTECTION AUTHORITY

This Plan is a culmination of numerous stakeholder meetings, individual interviews and consultations from 2004 to 2006. Without these consultations and the involvement of the numerous stakeholders below, this plan would have been unrealistic and impossible to develop. Many thanks to all of those who participated in the formulation of this plan, including many staff members of Anil Development, Attorney General's Office, Beca, the Chamber of Commerce, Council of the Iroj, CMI, HPO, IBC, MalGOV, MEC, MICS, MIMRA, MIVA, OEPPC, Public Works, PII, United Atoll Construction, USP and MICNOS. A special recognition must be given to the permanent staff of the RMI Environmental Protection Authority, notably Mr. Souvenior Kabua, Mr. Rito Akilang and Mr. John Bungitak as well as the Advisor, Mr. Caleb McClennen who facilitated the process that has led to this framework. The Coastal Program and the entire EPA extend a sincere appreciation to all that have given their valuable time to contribute to the various components of this program, and look forward to continue cooperation as the program builds for the future. Please send comments, questions or concerns via email to the EPA at eparmi@ntamar.net or Caleb McClennen at caleb.mcclennen@gmail.com.

INDEX

EXECUTIVE SUMMARY	4	5. COASTAL DATA COLLECTION SYSTEM	30
1. INTRODUCTION	6	5.1 Biological Data	
2. STATUS OF THE CCA	6	5.2 Remotely Sensed data management and analysis	
2.1 Director of Coastal Management		5.3 Coastal Geological Data	
2.2 Survey of Coastal Zone		5.4 Coastal Pollution	
2.3 Coastal Permits		5.5 Permitting and Violation Data collection	
2.4 Waste, Foreign Matter and Water Quality		5.6 Social Data Collection.	
3. CURRENT COASTAL CONDITIONS	10	6. EDUCATION AND OUTREACH	32
3.1 Coastal Stability		7. LEGAL MANAGEMENT OPPORTUNITIES	33
3.2 Marine Water Quality		7.1 Environmental Impact Assessment Regulations	
3.3 Coastal Quality		7.2 Earthmoving Regulations	
3.4 Coral Reefs and other Marine Health		7.3 Sustainable Development Regulations	
3.5 Human Health, Vulnerability and Economic Sustainability		7.4 Marine Water Quality Regulations	
4. COASTAL ACTIVITIES	13	7.5 Toilet and Sewer Facility Regulations	
4.1 Coastal Development	14	7.6 Solid Waste Regulation	
4.1.A Residential and Commercial Construction		7.7 EPA fining system	
4.1.B Landfills and Reclamation		8. LOCAL COASTAL MANAGEMENT PROGRAMS	36
4.1.C Coastal Protection		9. INSTITUTIONAL ARRANGEMENTS	39
4.1.D Aggregate Mining		10. FUNDING POSSIBILITIES AND EXTERNAL ASSISTANCE	40
4.1.E Residential scale beach mining		11. CONCLUSION	41
4.2 Living Coastal Resource Utilization	18	12. RESOURCES UTILIZED	42
4.2.A Fishing			
4.2.B Aquaculture			
4.2.C Diving, Tourism and Recreation			
4.2.D Conservation Areas			
4.2.E Marine Invasive Species			
4.3 Land-based Impacts	21		
4.3.A Human Waste			
4.3.B Animal Waste			
4.3.C Solid Waste			
4.3.D Outfalls			
4.4 Marine Activities	24		
4.4.A Vessel Discharges			
4.4.B Oil Spills			
4.4.C Shipwrecks			
4.4.D Artificial Reefs			
4.4.E Seaport Activities			
4.5 Natural Threats/Disasters	27		
4.5.A Sea Level Rise/Climate Change			
4.5.B Typhoons and Large Storm Surges.			
4.5.C Tsunami			

EXECUTIVE SUMMARY

The vast majority of the coasts throughout the Republic of the Marshall Islands are in pristine natural condition. However, as foreign aid has centralized the economy and rapidly increasing populations in several urban centers with little environmental oversight, the urban coasts and environment have become severely degraded, increasing population vulnerability, decreasing economic potential for sustainable development and increasing human health hazards. For this reason, this *National Coastal Management Framework*, called for under the Coast Conservation Act of 1988 (CCA), has been produced by the RMI EPA to review current coastal conditions and activities including dredging and sand mining, seawall construction, reclamation and landfills, coral reef degradation, solid waste management, human and animal waste management, shipwrecks and natural disasters among others as well as recommend proposals for action and policy for the RMI in 2008 to achieve sustainable future development and remedy past development in and around the coastal zone of the RMI. It is a 'living document' to be revised frequently, and officially reviewed in three years time. Important recommendations include:

Coastal Development

- New sustainable *Development Regulations* to more actively manage the range of coastal activities, bolster monitoring of both land-based and marine activities, meet the obligations of the CCA and minimize environmental impacts, maintain a sustainable shoreline, and prevent future erosion and marine pollution.
- A phase out of shallow water lagoon-side beach sand mining and dredging on a commercial scale is included in the aforementioned regulations.
- Continued national emphasis on the utilization of Environmental Impact Assessments (EIA) as a tool for management of major development projects.

Living Coastal Resource Utilization

- Promotion of sustainable utilization and conservation of living marine resources in cooperation with MIMRA and other interested organizations through local management plans, biological monitoring, and EIAs when necessary.
- Promotion of national conservation area program in recognition of the Micronesian Challenge.

Land-based Impacts

- Elimination of plastics and hazardous materials from private land-fills that may enter the lagoon, due to large storm surges or waste mismanagement.
- Three year phase out of private solid waste land-fills unless complete Environmental Impact Assessment is completed.
- Initiation of coastal clean-up program starting with up-current villages in Majuro and moving westwards.

Marine Activities

- More coordination and oversight over vessels, such that any ship that comes into the RMI can be extracted from the reef immediately once the accident occurs.
- Increased collection of information and enforcement of *Marine Water Quality Regulations* with visiting vessels regarding sewage and waste disposal, oil spills and special concern for invasive species.

Natural Threats/Disasters

- Awareness raising and capacity building in communities as to the potential impact of storm surges and typhoons such that shoreline defenses are adequate, and homes are not built too close to the shore where possible.
- Increased international promotion of the low-lying nature of the Marshall Islands, and the drastic potential of sea-level rise for the nation.

Coastal Data Collection System

- Long-term coastal monitoring system using both satellite and on the ground data to quantify and qualify pollution, water quality, coastal erosion and coral reef health.

Education and Outreach

- Educational campaign to promote a variety of components from this Framework, including advertisements, posters, community workshops and involvement of the NGO sector.

Legal Management Opportunities

- Revision of EPA fining system such that fines are given with warning, are of a fair value, and recourse is offered through the judicial system.
- Review of all regulations that apply to the coastal management including: solid waste, marine water quality, toilet and sewer, EIA and earthmoving regulations.

Local Coastal Management Programs

- Assistance to the Atolls of Majuro, Kwajalein, Jaluit and Wotje in the short-term to development local coastal management priorities and programs.
- Coordination with inter-agency group (MIMRA, MIVA, OEPPC, CMI, MICS etc.) to ensure that community based management is used to comprehensively deal with coastal issues in both urban and outer island communities.

Capacity Building at the EPA

- Increased training for EPA staff members, with special concern for acquiring environmental university degrees.
- Coastal Intern position to recruit current Marshallese university students for EPA.
- On site training by Environmental Advisor in EIA evaluation, environmental management, Geographic Information Systems etc.

1. INTRODUCTION

In 1988, the Coast Conservation Act (CCA) came into force empowering the RMI Environmental Protection Authority as the enabling agency. The need for a National Coastal Management Plan has been repeated in National Environmental Management Strategy (1992-96), Vision 2018 Document, and 2004-07 EPA Strategic Plan and numerous other national documents, both internal and external to the RMI government for the past fifteen years. In 2005, the RMI EPA conducted workgroups and built capacity to generate this report and enable its adoption in fulfillment of the CCA's directive to build the National Coastal Management Plan. In light of the diverse experiences across the RMI, it has become evident that a National Plan can only go so far to ameliorate find solutions for the coastal challenges in the RMI—and that cooperation with the private sector, civil society and local government are necessary avenues to fulfill the needs of improving the RMI's coasts. As well, though this document falls into said category, long paper documents of plans at the national level will accomplish little to resolve the serious threats to the coastal zone of the RMI. This paper should be viewed as a summary of activities and proposals, some already adopted and some proposed to protect and conserve the coastal zone of the Marshall Islands. Once approved – it will need continuous revision, and reassessment as progress is made nation-wide in the area of Coastal Management

2. STATUS OF THE CCA

The CCA calls for many actions, one of which is this plan. Briefly, this section reviews the status of other obligations under the act that are concurrently being dealt with in the EPA.

2.1 Director of Coastal Management

The Director of Coastal Management in the RMI is the General Manger of the RMI EPA, per CCA §4(1). Given the range of duties potentially necessary for a Director of Coastal Management to complete – a separate position could certainly be justified under the supervision of the General Manager. At this time, for reasons of financial and bureaucratic efficiency the General Manager is proposed as the “Director” in the complementary “Sustainable Development Regulations.”

2.2 Survey of Coastal Zone

§306 of the CCA calls for an extensive survey of the Coastal Zone to be commenced. This survey is currently underway, primarily through the development of Geographic Information System (GIS) databases from satellite imagery and on the ground data collection on Majuro, Ebeye, Jaluit and Wotje. (see Figure 1 below) Current land-use, infrastructure, coral reefs (and benthic habitat in general), aggregate resources, recreational and religious areas, wetlands, and research areas are all included in the survey. A separate report on erosion in the Coastal zone will be generated to analyze the changes to the shoreline of at least the four Major Atolls from World War II to present. Economic cost will be estimated from constructed current land values. SOPAC in cooperation with the RMI EPA has completed a study in November of 2005 that comments on the economic importance of aggregate extraction in the RMI. Table 1 presents the requirements of §306 and their current status in more detail. Figure 1 presents the extent to which the Coastal Survey has been completed.

Table 1. CCA §306 Survey of Coastal Zone requirements and status.

Requirement	Source	Majuro	Ebeye	Jaluit	Wotje
(a) an inventory of all structures, roads, excavations, harbors, outfalls, dumping sites and other works located in the Coastal Zone;	IKONOS imagery	✓	✓	✓	✓
(b) an inventory of all coral reefs found within the Coastal Zone;	IKONOS imagery	✓	✓	✓	✓
(c) an inventory of all commercially exploitable mineral deposits, both proven and suspected, located within the Coastal Zone;	SOPAC, EPA and IKONOS imagery	✓	✗	✗	✗
(d) an inventory of all areas within the Coastal Zone of religious significance or of unique scenic value or of value for recreational purposes, including those areas most suitable for recreational bathing;	IKONOS imagery, local knowledge	✓	✓	✓	✓
(e) an inventory of all estuarine or wetland areas within the Coastal Zone with an indication of their significance as fisheries or wildlife habitat;	IKONOS imagery	✓	✓	✓	✓
(f) an inventory of all areas within the Coastal Zone of special value for research regarding coastal phenomena, including fisheries and shell fisheries, sea erosion, littoral movements and related subjects;	IKONOS imagery, communication with past and present researchers	✗	✗	✗	✗
(g) an inventory of all areas within the Coastal Zone from which coral, sand, sea shells or other substances are regularly removed for commercial or industrial purposes;	IKONOS imagery, EPA records	✓	✓	✓	✓
(h) an assessment of the impact of sea erosion on the Coastal Zone including a quantified indication, by geographical location, of the amount of land lost thereby, an estimate of the economic cost of such loss and the extent to which human activity has contributed to such loss;	IKONOS imagery, historic aerial photography	✓	✓	✓	✓
(i) an estimate of the quantities of sand, coral, sea shells and other substances being removed from the Coastal Zone, together with an estimate of the extent to which such quantities can be supplied from other sources or other materials and an analysis of the economic practicability of doing so; and	SOPAC and EPA research.	✓	✓	✓	✓
(j) a census, classified by geographical areas, and by activity, of all workers currently engaged on a regular basis in the removal of coral, sand, sea shells or other substances from the Coastal Zone and a census of the dependents of such workers and estimate of the per capita income obtained from these activities.	SOPAC research	✓	n/a	n/a	n/a

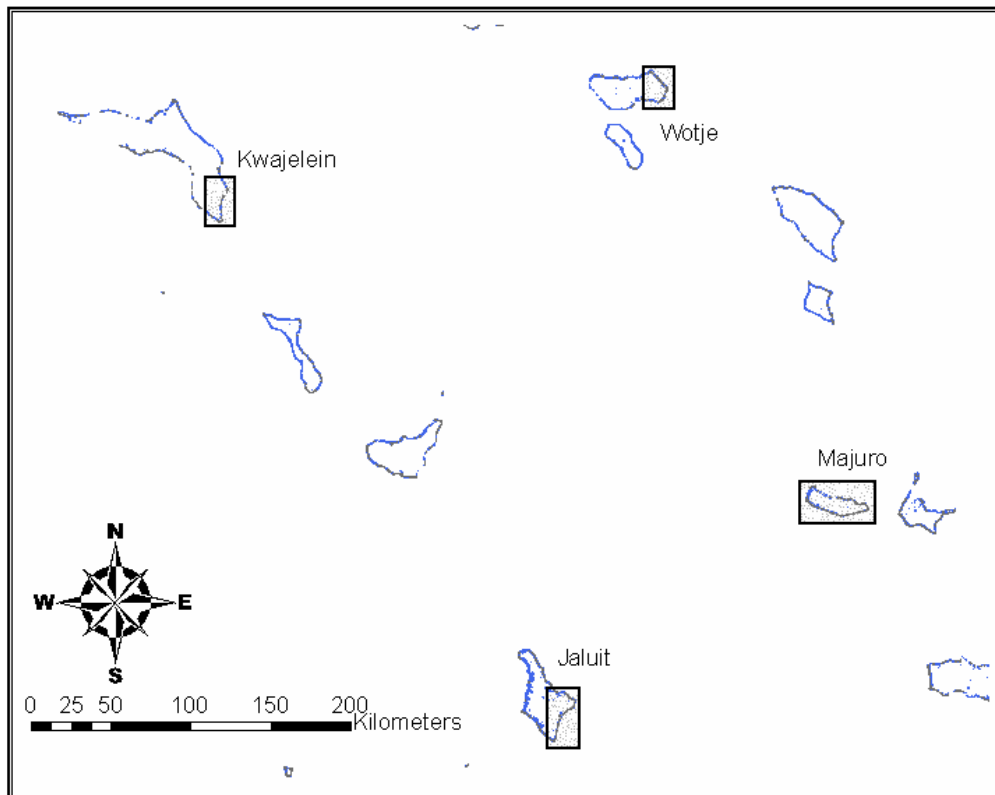


Figure 1. Map of Areas covered by current Coastal Survey process.

2.3 Coastal Permits

§309 of the Act requires that a permit procedure be established by the RMI EPA for “any development activity other than a prescribed development activity within the Coastal Zone except under the authority of a permit issued in that behalf by the Director.” These regulations are in a draft phase and are simultaneously in their public comment review period. Instead of proposing a separate set of regulations independent of current Earthmoving Regulations, the proposed Development Regulations super-cede those regulations. New fee structures are proposed, as well as a simplified system for all forms of development both within and outside of the coastal zone in the RMI. These permits, if accepted, will provide even more strength to the currently functioning environmental impact assessment (EIA) process. Specifics of the proposed permit system will be discussed later in this plan.

2.4 Waste, Foreign Matter and Water Quality

§320 requires for the Director to give direction regarding various activities associated with waste generation, other foreign matter and water quality within the Coastal Zone. For these reasons this national framework will include detailed policy solutions for said concerns. To date, the Coastal and Land Management Department in the EPA has only been involved with illegal construction that may indirectly relate to issues of coastal quality and oil spills

that occur throughout the lagoon. Solid Waste has been left to the Solid Waste Division. However, this plan will cover issues such as Coastal Quality so that the Coastal and Land Management Department will increase its mandate to concern coastal water quality and waste in, or that may end up in, the coastal zone.

3. CURRENT COASTAL CONDITIONS

3.1 Coastal Stability

A number of reports have documented the problems of erosion in the Marshall Islands, particularly in Majuro. The problem is most acute in the urban Atolls, specifically the DUD area of Majuro and Ebeye, where sea walls, coastal dredging, beach sand mining and



continued environmental change has devastated what was once a natural beach barrier. Eroding coasts in the urban RMI are the norm rather than the exception. Outside these urban areas, natural causes dominate such as storm surges and sea-level rise, though land clearing and removal of protective indigenous vegetation from the coasts is a major cause of the problem in rural areas. Erosion is evident on nearly every Atoll to some extent as evidenced by falling vegetation, exposed beach rock and historically receding shorelines. It is hypothesized that rising sea levels will only add increasing difficulty to dealing with this problem. Recognizing that global sea-level rise is beyond the control of the RMI government, action must be taken immediately to halt the human-induced damage to the shoreline.

3.2 Marine Water Quality

The Majuro and Ebeye Lagoons are significantly more polluted than those in comparable outer islands. The effects of high levels of human and animal waste are witnessed



throughout the Eastern half of Majuro Lagoon and just off Ebeye Island. This is primarily evident by the heightened levels of algal over-growth, declining reefs and increasingly green waters. Sedimentation from development projects, land-based run-off and eroding shorelines also increasingly threatens the quality of RMI marine waters. Oil spills are a frequent problem in the urban lagoons, and in times of heavy ship traffic and rains, a daily occurrence. Currently EPA testing for *E.coli* bacteria is restricted to the urban Majuro and Ebeye lagoons. In Outer Islands, Coastal water, though untested at this point appears from observation to be in its natural, pristine state.

3.3 Coastal Quality

Throughout the urban centers of the RMI, coastal quality has been devastated – either through beach pollution, makeshift garbage seawalls, rusting hulks of vessels and



automobiles, human and animal excrement. Further from the urban centers the shorelines are mostly covered with plastic garbage that has washed up from the polluted population centers. A failed solid waste management system, and resulting solid waste management at the household level is the central reason for such a problem. Years of technical reports and meetings have done little to influence the solid waste problem in Majuro. On Ebeye, assistance from the USAKA base has improved conditions

markedly. However, in Outer Islands, the problems of solid waste management are becoming more evident, with a failed public dump in Jaluit, and increasing amounts of non-biodegradable and toxic substances being transported to the outer islands each year.

3.4 Coral Reefs and other Marine Health

The health of marine ecosystems is vital to the preservation of human life in the RMI. Not only are coral ecosystems providers of food and tourism income, but they provide the



continuing physical structure of the islands. Without an active marine and reef flat ecosystem, the islands would quickly erode away—maintaining their health is a vital survival issue. Outside of the immediate urban areas, the coral reefs of the Marshall Islands are in pristine condition, though where humans are in greatest concentration numerous threats to the corals have been identified by experts. Coastal construction, land-based run-off, pollution, human and animal waste among others all contribute to declining coral health. As well, over-fishing

of coastal fisheries for sustenance and small scale commerce has resulted in ecosystem imbalances in urban areas such as the large increase in crown of thorns population increases in some islands due to a lack of predators, and scarcity of certain species.

3.5 Human Health, Vulnerability and Economic Sustainability

Poor solid waste management, lack of appropriate treatment and facilities for human waste, and a densely populated and vulnerable shoreline all pose serious concerns for the health



and lives of the population on Majuro. Centrally through water-borne diseases, such as cholera and amoebas, human health can be severely affected by these coastal concerns. As well, with many of the urban poor population in Majuro currently being forced to settle on reclaimed and vulnerable land – their lives are threatened by the potential for large storm events such as typhoons, storm surges and astronomical high tides. Coastal management is not environmental management only for the sake of keeping the RMI clean; it is an essential step to sustainably

developing the social and economic conditions of the coastal country. Several significant economic impacts of declining coastal quality are evident in the Marshall Islands.

Economists at the South Pacific Regional Geoscience Commission (SOPAC) have costed the losses due to coastal erosion and protection at over \$400 million for Majuro alone over the past 25 years. These costs are mainly through losses of productive and inhabitable land, and the protections that are erected to prevent such a loss. Tourism has been negatively impacted by the unsightliness and low interest of tourist in polluted and unhealthy beaches. Aquaculture development depends on sources of clean marine water, preferably near the population centers, as well as healthy sources for controlled production. Many Marshallese rely on locally produced fisheries for either income or food security, the preservation and management of which is vital.

4. COASTAL ACTIVITIES

Numerous coastal activities impact the coastal zone with both constructive and destructive effects. Table 2 (below) lists the range of coastal activities addressed by this framework, and assesses their relative effect on the variety of coastal conditions from section III above. This section proposes recommendations for programs of actions to be taken at the National, Local and Community Level. EPA has initiated many of these activities to date as indicated in the following pages (**Actions** have already been committed to by the RMI EPA, **Recommendations** have yet to be adopted.)

Table 2. Coastal Activities :  (destructive) or  (constructive) for a particular coastal condition

Coastal Activity		Coastal Conditions				
		Coastal Stability	Marine Water Quality	Coastal Quality	Coral Reef and Coastal Ecosystem Health	Human Health, Vulnerability, and Economic Sustainability
1. Coastal Development and Commerce ★★★★★	A. Residential and Commercial Construction					-
	B. Landfills and Reclamation					
	C. Coastal Protection	 	-	 	 	 
	D. Aggregate Mining					
	E. Residential Beach Mining					 
2. Living Coastal Resource Utilization ★★★★	A. Fishing	-	-	-		 
	B. Aquaculture	-	 	-	 	
	C. Diving	-				
	D. Tourism and Recreation	-				
	E. Conservation Areas					
3. Land Based Pollution ★★★★★	A. Human Waste	-				
	B. Animal Waste	-				
	C. Solid Waste					
	D. Outfalls	-				
4. Marine Based Pollution ★★★★★	A. Vessel Discharges	-		-		
	B. Oil Spills	-				
	C. Shipwrecks					
	D. Artificial Reefs	-	-	-		-
	E. Seaport Activities	-				-
5. Natural Threats and Disasters ★★	A. Sea Level Rise		-	-		
	B. Typhoon		-	-		
	C. Tsunami	-	-	-	-	-
	D. Storm Surges		-	-		

4.1 Coastal Development

The vast majority of economic activity in the Marshall Islands is government funded, and as such allows for the potential for a great deal of environmental oversight. Until recently, this oversight has been virtually non-existent. Coastal Development can be divided into three general tiers: major government funded projects, smaller private sector projects, and poorly or non-funded residential projects. In each case, there is a different scale of appropriate action to be taken. Coastal Development world-wide has been identified as one of the greatest threats to a healthy coastal system. Alterations to natural shorelines, aggregate extraction such as beach mining and near-shore dredging, expanding reclamation and direct construction impacts such as run-off and sedimentation all contribute the greatest threat to the coastal systems of the RMI in both the urban and rural atolls.



4.1.A Residential and Commercial Construction

Status: Construction projects are currently under the sole management of the RMI EPA. There are no building codes, no zoning plans, and limited interagency communication necessary from the construction of a small one room home to an entire office building or warehouse. While the EPA has limited ability to only manage certain environmental impacts of construction projects, and can utilize the EIA regulations to vet major concerns, there are numerous planning and sustainability questions that should be addressed for construction projects in the future. This must be done in collaboration with the private sector, utilities companies, local governments and traditional land-owners to best find a sustainable path to managing the construction boom in the RMI. Additionally, small homes are continuously being built in the increasingly dense urban areas, such as Jenrock in Majuro and Ebeye. These shanty type communities are extremely vulnerable to large storm events, not readily accessing public utilities and experience extremely poor sanitation conditions due to their poorly planned nature.

Management Proposals:

- **Action :** Consider the requirement in EIA regulations to ensure that projects are compatible with their surrounding land-uses, as well as not reducing urban scenic quality. This role is extremely important until such a time that Local Governments can effectively implement the Planning and Zoning Act. Both the EIA and Environmental permit procedures can be used for this planning purpose.
- **Action :** Gradually increase the requirements on developers to keep clean construction sites, free from run-off, and built in a manner to minimize impact on the environment and coastal zone. Additionally, the draft Development Regulations require for commercial projects to have an Environmental Management Plan to minimize environmental impacts.
- **Recommendation :** Enact local ordinances to enable zoning requirements and limited new home construction in Majuro and Ebeye. As well, Outer Islands such as

Jaluit and Wotje have the potential to experience the same problems if planning actions are not taken immediately.

- **Recommendation** : Encourage vertical development, though economic forces have already begun to drive this transition. As buildings get larger, the need for building codes increases.
- **Recommendation** : Shoreline residences that are directly threatened by storm water should be encouraged to have elevated bases (stilts).
- **Recommendation** : Building Code regulations on public and private buildings are a necessity for the increasingly urbanized and vulnerable atolls.

4.1.B Landfills and Reclamation

Status: According to the RMI Public Lands Act, landowners have the right to reclaim their near-shore land, pending approval by the Chief Secretary of the national government. This legislation, as well as little or no restrictions on land reclamation in the RMI have led to numerous small scale reclamations that have resulted in large scale losses of natural beach, and protective barriers from the ocean. A great deal of the erosion evident in urban Majuro and Ebeye is most likely due to this uncontrolled and unplanned reclamation. Though reclamations require an earthmoving permit from the EPA, the activity is seen as a traditional right – even though customary reclamation is virtually non-existent in outer islands. The activity has led to highly unstable and vulnerable coastal areas and populations, many reclaimed with refuse, food wastes, and unstable vegetation. Additionally, as is detailed in the following section, the seawalls surrounding these landfills are haphazard and potentially create more vulnerability than they help avoid in the case of a large storm event. Importantly, a central challenge to the management and any potential limitation of land reclamation is the scarcity of land in the urban centers, along with exploding populations.

Management Proposals:

- **Action** : Utilize effective Development Permitting to ensure environmentally sound design and construction of reclamation projects via consultation and the use of Environmental Management Plans. This Permitting shall foremost consider the necessity of landfills and the potential environmental cost to neighboring properties.
- **Action** : Prohibit the use of plastics and other floatable waste in private landfills.
- **Action** : Limit reclamation projects in rural areas that have no need for territorial expansion into the lagoon or ocean, where environmental costs outweigh economic benefits.
- **Action** : Encourage shoreline uniformity with reclamation projects in urban areas.
- **Action** : Facilitate artificial beaches for public and private utilization in design of reclamations.
- **Recommendation** : Promote larger scale cooperative projects for reclamation (potentially government sponsored) to unify shoreline and reduce vulnerability of poorer neighborhoods in urban areas.
- **Recommendation** : Reconsider the perceived right to reclaim, empowered under the Public Lands Act. This right only exist with the consent of the government (in the form of the Chief Secretary), and hence is not an automatic right. All marine zones of the RMI below high water mark are the property of the government of the

RMI, and it should be viewed more accurately as a “limited privilege” to reclaim land, not a right.

4.1.C Coastal Protection

Status: A great deal of coastal protection has been erected to enclose the previously discussed reclamation areas. Due to sea-level rise, a drastically human influenced shoreline, and beach-mining the coasts of the RMI experience extreme eroding pressure from the oceans. The majority of this in urban areas is due to the lack of planning and uncontrolled reclamation that has devastated the natural integrity of the coast. From Rita to the Airport in Majuro and on Ebeye, nearly 100% of the shoreline is protected by some form of coastal barrier. Coastal protection in the RMI ranges from riprap boulders extracted from the Oceanside to engineered vertical concrete seawalls to piles of vegetation and trash as pseudo barriers. Another issue is the increasing amount of steel cars, trucks, and other machinery that is populating the Majuro shoreline, these solutions leak oil, provide unsafe environments for RMI youth, and tremendously decrease tourism potential.

Management Proposals:

- **Action:** Landowner and developer workshops, consultations and guidelines shall be organized by EPA to discuss the proper technologies for seawall construction, as well as be incorporated into permit requirements, to achieve the following goals:
 1. Promotion of utilization of natural vegetation for the protection of the coasts over engineered solutions. “Best seawall is no seawall”
 2. Longevity of coastal protection
 3. Decrease of wave energy
 4. Designed ability to handle wave overtopping in large storms
 5. Integrity and Uniformity of the shoreline
 6. Preservation of active beach system (if existent)
- **Action :** Utilize permit fees from environmental permits to provide economic incentives to set-back from the ocean.
- **Recommendation :** Pilot projects in sustainable coastal protection using vegetation and setbacks should be endorsed by EPA
- **Recommendation :** Remediation of environmentally unsafe shorelines such as plastics, metal trash, waste etc. Potentially, some of these can be re-exported.
- **Recommendation :** Imported material such as cars and other large metallic objects should be taxed to provide for a re-export of their bodies once they can no longer operate. EPA shall coordinate a meeting at the national level to discuss this issue with importers and government agencies. A centralized collection site for metallic waste must be organized.

4.1.D Aggregate Mining

Status: Coastal dredging places considerable pressure on the coastal zone of the RMI. Additionally, many outer islands have small-scale aggregate extraction sites, though currently

undocumented. Majuro has four operational dredge sites at the time for the writing of this report, three on the lagoon side and one on the ocean. Though local aggregates are expensive relative to other countries, their cost clearly out compete imported materials for both small and large scale construction. It has been documented, that dredging of near-shore aggregates is unsustainable and places and contributes to a number of environmental problems in the RMI, including erosion, fisheries impacts, coral reef degradation, aesthetic impacts, and decreased natural protection from storms and tidal events. Additionally the near-shore dredging limits the future ability to reclaim the near-shore reef flat which may be necessary in the urban environments of Majuro and Ebeye, given the ever increasing population pressures. The only sustainable solutions for aggregate extraction are to remove them from places where they have already been removed from the near-shore system, or better still are situated in an area of good aggregate production, such as those identified in the SOPAC Technical Aggregate Report.

Management proposals:

- **Action :** EPA regulated phase out of lagoon side dragline dredging via new development regulations. The lagoon-side dragline operations have created lasting pits throughout urban Majuro that fill only partially with silt and algae, have no chance for coral regrowth, increase hazardous from large waves, contribute to the eroding shoreline, and limit future reclamation possibilities.
- **Action :** Promotion of lagoon bottom suction dredging via technical feasibility assessment of the environmental impacts and economics of the operation. SOPAC has identified several offshore sites that have suitable aggregate for much of the construction needs of the RMI. While they are slightly more expensive to exploit, their environmental costs are substantially less, as well as reducing the loss of near-shore land potentially available for reclamation in urban areas. Offshore dredging is already occurring in a number of pacific island countries.
- **Action :** Promotion of aggregate importation – especially for major international funded projects. Funding for projects vary depending on the requirements of the host country. If the RMI EPA pushes for importation instead of ocean-side blasting, potentially the donor can contribute the necessary funds to make up the cost difference – for a greatly improved RMI environment.
- **Action :** Active biological and sedimentation monitoring of dredge operations.
- **Action :** Full EIA for any dredging operation.
- **Recommendation :** Complete inventory of dredged area in Majuro and throughout RMI compute rate of depletion, versus available area.

4.1.E Residential scale beach mining

Status: A SOPAC study conducted in cooperation with the RMI EPA in August of 2005 reveals that nearly as much aggregate that is being extracted by commercial operations is illegally being extracted by residents of Majuro, and undoubtedly this is the same trend in outer islands. The extent to which this is contributing to coastal vulnerability is unknown, however it can only be negative. However, the competing needs for small amounts of aggregate for funerals, small home projects, etc. would be very difficult to regulate at the current capacity. As well, the practice is so widespread (with 80%) of houses in Majuro participating, that a major behavioral transformation would be necessary.

Table 3. Percent of Majuro Households engaging in aggregate extraction

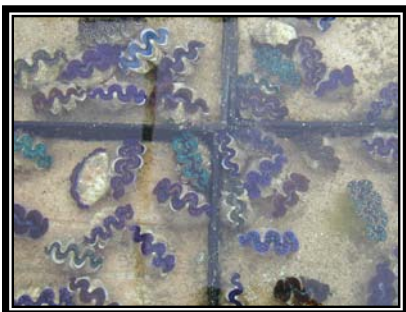
Household Use	% of households
Decoration	80%
Home construction	47%
Landscaping	33%
Funeral	15%
Seawall	3%
Other	2%
Reclamation	1%
Commercial sale	0%

Management proposals:

- **Action :** Promote a shift in urban atolls to using dredged material for traditional purposes, instead of hand-collected materials.
- **Action :** A work program with local government shall initiated, and incorporated into local coastal plans, to evaluate and determine a policy solution to the large problem of traditional collection of aggregates from the coastal zone.
- **Recommendation :** Local governments should propose suitable locations as resource collection areas: certain locations that are off limits for sand and rock extraction, and other areas that are identified are utilization zones. Small-scale extraction can potentially be sustainable, but not on the current scale as in Majuro.

4.2 Living Coastal Resource Utilization

Currently under the mandate of MIMRA, living coastal resources are utilized to an unknown extent throughout the Marshall Islands. On one end of the spectrum, several shark finning



operations have recently been in operation – a practice that is frowned upon world-wide, while on the other, several sustainable and nearly closed loop aquaculture ventures (clam, corals and pearl oysters) are currently operating. In between, a live reef fish trade for aquariums, and a large scale coastal fishery for food fish take in the brunt of the wild capture. Though fisheries have a great deal of challenges in the RMI, particularly due to the lack of sufficient data and regulatory regimes, the EPA Coastal Management department, primarily for lack of resources is

recommended to only act in a supporting role in this area, and focus most on conservation projects. That is, unless a major new fishery operations (ie. Aquaculture, secondary fishery activities, large scale operations) are required to engage in an Environmental Impact Assessment. The potential for such projects is very real, as one of the few options for true private sector development in the RMI concerns its central fishery resource and associated industries.

4.2.A Fishing

Status: Currently, coastal fisheries can be divided into three loose categories. Food fish for subsistence livelihoods, food-fish for commercial sale, and aquarium fish for export.

Given the small population of the RMI on a national level there is a large area of coral cover and associated fish habitat. However, high population densities in urban centers predictably over-fish their near-shore stocks. MIMRA is currently completing their coastal surveys of fishing in Majuro. But, these give only a rough idea of the urban fisheries. Their chosen management tools are a system of locally managed marine protected areas, and several species catch dates. As well, leaders in the outer islands occasionally utilize the traditional 'mo' system for short term protection.

Management proposals:

- **Action :** Actively support MIMRA efforts to manage coastal fisheries with community based plans through inter-agency marine and coastal groups.
- **Action :** Engage in reef fish data collection to monitor health of stock (in association with MIMRA.)
- **Action :** Initiate fish and reef data collection at popular tour sites with local tourism operators.

4.2.B Aquaculture

Status: Aquaculture in the RMI has yet to realize its true potential, not through lack of funding by national and international projects. As such, aquaculture in the RMI currently provides little if any environmental impact. This said, certain forms of aquaculture have a potential for substantial environmental impact, and the EPA should maintain vigilance regarding what new development projects are proposed throughout the RMI.

Management proposals:

- **Action :** Ensure that any major new Aquaculture project is vetted for potential EIA if project has "significant" environmental impact. (per EIA regs.)
- **Action :** Incorporate aquaculture activities into EPA Permitting system, so as to monitor impacts and have environmental oversight over operations.
- **Action :** Support MIMRA efforts to actively promote aquaculture development in the RMI.

4.2.C Diving, Tourism and Recreation

Status: Several joint diving and tourism operations currently exist in the Marshalls, on Majuro, Jaluit, Arno, Bikini and Rongelap, as well as a rising potential live-aboard industry. These operations are the essence of sustainable development in the RMI. Their efforts should be given the full support and approval of the RMI EPA. This sector can be utilized to promote protected areas, beach clean ups, and the necessity of environmental protection for economic development. Additionally, Potentials for large foreign investment in tourism could mean major environmental impacts that can and should be minimized.

Management proposals:

- **Action :** Cooperate with MIVA and local partners to promote environmentally sound tourism operations.
- **Action :** Provide educational materials to MIVA for tourists regarding RMI environment.
- **Action :** Ensure that any new tourism development is properly permitted, monitored, and incorporated into EIA process if necessary.

4.2.D Conservation Areas

Status: The current status of conservation area protection in the RMI is dismal. Several local efforts have been supported at the national level, but otherwise there is a definite lack of national recognition and coordination for conservation projects. With no nationally recognized protected area or park system, conservation efforts are not cohesive and lack the dedication and support of appropriate agencies. Currently, the Coastal Management Advisory Committee has in its mandate to coordinate these efforts in the marine realm. Two projects, the MIMRA fisheries management plans in Arno and Majuro, and the EPA Jaluit project have had some success. As a result, there are several “paper park” conservation projects, but as of the writing of this report, no adequately recognized and operated national system of protected areas. This is a major gap in the governance of the Marshall Islands that should be remedied as soon as possible. The President of the RMI in early 2006 committed, along with the Presidents of the FSM and Palau, to the ‘Micronesian Challenge’, to protect 25% of land and marine territory by 2020.

Management proposals:

- **Action :** Utilize the Coastal Management Framework as a catalyst for national level conservation area recognition by drafting new conservation regulations. This program shall include:
 - A legal mandate
 - Privately-owned but publicly recognized and supported conservation projects.
 - Capacity building support for local conservation areas, as well as provision of maps, capacity building and general support.
 - Small initiation of project with eventual goal of large national network.
- **Action :** Promote local fishery management plans and their associated ‘mo’s in cooperation with MIMRA and inter-agency marine and coastal groups.
- **Action :** Develop incentives for privately initiated conservation projects.

4.2.E Marine Invasive Species

Status: Currently, there is little data available in the RMI concerning the threat or occurrences of invasive species. However, world-wide there is increasing concern regarding invasives and their potential deleterious impact on coastal systems. The increasing ship traffic in Majuro lagoon provides a large potential for introduced marine stocks, and the EPA must take action to at a minimum begin to understand the threat.

Management proposals:

- **Action :** Utilize EPA ship-boarding agent to check ship logs and be sure that ballasts are being pumped prior to entry into RMI territorial waters.
- **Action :** Continue to cooperate with international efforts to restrict the potential of marine invasives, including inspection of ballast water (either biological or physical).

4.3 Land-based Impacts

As in most coastal environments, some of the greatest impacts to the near-shore environment are from activities based on nearby land. Though the RMI is in some ways



lucky enough to not have watershed and riverine systems to concentrate wastes on certain coastal areas, and the ocean and lagoon waters are extremely well flushed in most Atolls, immediate impacts of human populations are creating devastating effects on the urban Atolls of Majuro and Ebeye, as well as the rising urban center of Jaluit, and to a lesser extent on Wotje. These impacts include inappropriately managed human and animal waste, solid waste and outfalls from a variety of industrial activities. Managing these activities, with the

exception of major outfalls, involves a necessarily decentralized approach, though several major infrastructure improvements would be necessary for the human and solid waste problems. While a range of work has been done to analyze the solid waste problem, reports have also focused on the inadequate treatment of human and animal waste in the RMI.

4.3.A Human Waste

Status: Currently, human waste is only minimally regulated in the RMI. A public sewer system is available in urban Majuro and Ebeye, and pseudo-septic systems are utilized elsewhere. However, these septic systems are never pumped to remove sludge, thus slowly seep into either the lagoon and ocean waters, or the increasingly contaminated fresh water lens. Otherwise, human waste is dealt with in a basic manner either in small pits, or directly input to ocean and lagoon waters. The impact on near-shore reefs in the urban lagoons is evident with high levels of algal overgrowth and nutrient loading, though data besides observation is currently not available. Concerning the Outfalls of Majuro and Ebeye, the latter is non-functioning and scheduled for repair and the former creates a large plume on the Oceanside of Delap. Both are not currently monitored for biological and chemical criteria, and receive zero treatment. Finally, direct human input of waste into ocean and lagoon waters, though decentralized, directly impacts near-shore waters, and to the extent possible should be concentrated on the seaward edge of ocean reefs, and avoided entirely in lagoon waters.

Management proposals:

- **Action :** Begin to collect monthly coastal data in urban lagoons on nutrient loading, to monitor condition of urban waters.
- **Action :** Partner with USDA Rural housing project to be sure that all new houses are connected to public sewer in urban centers.

- **Recommendation** : Fulfill mandate of Toilet and Sewer regulations that all urban households be required to connect to the public sewer system. Require sewer connection of all new households and a phase-in requirement for currently existing households.
- **Recommendation** : Monitor extent of pollution on ocean outfalls to establish if zone of contamination is spatially increasing, decreasing or steady. This used to happen, but was stopped in the 1990s. Data must be reliable and consistent throughout the year.
- **Recommendation** : Engage local governments to initiate community awareness campaign concerning direct utilization of ocean and lagoons as latrines.
- **Recommendation** : Discuss with Public Works potential of getting trucks to pump septic systems and deliver to waste collection facility.
- **Recommendation** : National Government should place a high priority on remedying conditions at Ebeye sewage disposal facility. Additionally, proposals should be considered for a wastewater treatment plant and public sewer system for Laura Village.
- **Recommendation** : Seek technical assistance for solutions to rural waste, such as 3-4 chamber design with leach fields, and low entropy systems used elsewhere. Especially in cases such as Laura where the ground water lens is vulnerable to human waste seeping from “septics”.

4.3.B Animal Waste

Status: Piggeries, though currently undocumented are increasing in concentration in urban centers, bringing with them a substantially large amount of waste. Unfortunately, a large quantity of these piggeries utilizes the lagoon and ocean as their flushing system for waste products and, similar to human waste, directly contribute to coastal pollution. This direct input of waste, especially on lagoon shoreline, can easily be avoided with tougher regulation, community awareness and the provision of viable alternatives, such as composting.

Management proposals:

- **Action** : Conduct census of coastal piggeries in urban areas.
- **Action** : Investigate waste system of pig farm in Laura.
- **Recommendation** : Toughen enforcement of local piggery laws and cooperate in enforcement. Concentrate efforts initially on lagoon side piggeries.
- **Recommendation** : Engage local government in community outreach and education concerning the impacts of piggeries on coastal waters, including human health and fishery issues.
- **Recommendation** : Assist in establishing utilization of piggery waste as fertilizer for potted plants and crops further out from urban centers. A dry compost system should successfully decrease associated odor issues.

4.3.C Solid Waste

Status: In most outer islands, solid waste issues are successfully dealt with by digging small pits inland and eventually covering these, or small scale burning. However, as most officials

in the RMI are aware, solid waste issues in the urban atolls are an increasingly serious problem. Primarily in Majuro, the landfill solution has created often more problems than it has helped solve, there are no efforts to reduce waste generation, few efforts in re-use, composting or recycling, massive amount of coastal dredging are necessitated to cover the large dump areas, and failed management systems scatter large amounts of trash around the atoll and lagoon beaches. As a result of the current collection and management system, many residents adopt their own private landfill systems, that are similarly mismanaged, and on most spring high tides flood the lagoon and ocean with garbage and provide significant health and vulnerability hazards.

Management proposals:

- **Action :** In the short term, refuse to permit new private landfills until current landfills are under control.
- **Action :** Require and utilize EIAs as a tool to find more sustainable low cost solutions for solid waste management in public dump, and ensure that all future dumps are permitted facilities with a completed EIA prior to their approval by EPA (as required in the solid waste regulations.)
- **Action :** Initiate a coastal clean-up campaign in all atolls. In Majuro, coastal monitoring and clean-ups for beach pollution shall start in certain up-current target areas (DUD) and moving outwards towards Laura in Majuro. Active management of these target areas will continue as the program moves west. The campaign must take a strong, slow and sustained approach to revitalizing the coastal zone from waste, and focus with the following objectives:
 - removal of all plastic wastes from private landfills
 - capping and closure of unnecessary landfills
 - demand for coastal permit of all existing landfills
 - continuous monitoring for compliance with solid waste and development regulations
- **Action :** Work with private sector to assist in their innovation concerning solid waste minimization potential. Hold initial meeting on private sector sustainability and push for business to conduct waste stream reduction assessments as well as careful consideration for import of Styrofoam and other plastics.
- **Action :** Through the new sustainable *Development Regulations*, include private coastal waste reclamations as one of those activities to be phased out over a three year period. Waste shall be contained inland from the coastal zone, or in an adequately permitted and EIA approved public or private waste facilities.
- **Recommendation :** Prioritize solid waste on the national level. What is now a problem on a few atolls will quickly spread to more outer islands – especially concerning toxic materials and eventually the limited availability of land.
- **Recommendation :** Push for international or national funding of a major revision of the solid waste management system in the RMI. Including composting, recycling and import levies on waste that needs to be removed from the island.

4.3.D Outfalls and Wastewater

Status: Currently, several outfalls exist in the RMI for industrial operations, however, none are permitted. More importantly, the road system in Majuro contains many outfalls that are unfiltered and input a great deal of oil, waste, sediment and other materials into the lagoon in times of heavy rain. A first step towards understanding the impacts of these outfalls should include biological and chemical criteria assessments and monitoring. As well the current Marshall Islands Pollution Discharge Elimination System permits requirements under the EPA Marine Water Quality Regulations are not being enforced.

Management proposals:

- **Action :** Inventory all outfalls from industry, road infrastructure, sewage and otherwise.
- **Action :** Begin monitoring of water quality and biological criteria at outfalls sites on a monthly basis.
- **Action :** Monitor lagoon after heavy rain for point sources of pollution that can be assisted.
- **Action:** Review marine water quality regulations and include outfall permitting in new development regulations to avoid redundancy. Permitting of outfalls would require a phased in approach as with all aspects of this plan, to allow for adequate adaptation by developers.

4.4 Marine Activities

As an oceanic nation, a range of marine activities impacts the coastal zone of the RMI. Primarily, the presence of large vessels and their associated discharge in the urban lagoons,



as well as the potential for oil spills, shipwrecks and other accidents create a largely unmanaged impact to date for the coastal waters. Considering there is a national strategy for economic development that focuses on the Marshalls as a future center for fishing interests in the Pacific, environmental oversight must be increased. Currently the involvement of the EPA concerns de-ratting certificates as well as violations for oil spills and shipwrecks. A more pro-active mission is necessary to facilitate improved performance in the marine areas,

including outreach to other agencies, primarily the Ports Authority, shipping agents and fishing ventures. With EPA currently on the boarding team for visiting vessels, there is an important opportunity to raise awareness of local laws, the consequences of oil spills, and inspection of necessary sewage and water treatment facilities on board.

4.4.A Vessel Discharges

Status: Currently there are strict laws concerning what can and cannot be discharged into the lagoon and near-shore waters by both visiting and domestic vessels. While the potential for penalties is very high compared to other environmental infractions, the rate of enforcement vs. the estimated rate of violation is extremely low. In other words, many violators are getting away without being caught. Most importantly however, no data exists

on the extent to which vessels pump their sewage. Technically, the larger vessels have the potential to hold much more of their waste, while smaller fishing vessels are subject to a greater risk of pumping into the lagoon waters.

Management proposals:

- **Action** : EPA shall monitor twice-weekly the ships in the harbor for illegal discharges, potentially in cooperation with Ports Authority.
- **Recommendation** : Enlarge EPA inspection of vessels to not only deratting, but also inspection of sewage treatment facilities, and awareness raising concerning the potential consequences of illegal discharge. Include environmental permit in vessel inspection and include in sustainable development regulations.
- **Recommendation** : Utilize ship agents to be sure incoming vessels have adequate holding tanks for their stay and that ballast water is not discharged in the lagoon.

4.4.B Oil Spills

Status: By observation, oil spills into the urban lagoons are a nearly daily occurrence in the RMI. Though some of these spills are land-based, a great number are from the larger vessels in the lagoon of Majuro. Not only are oil spills an environmental hazard, the constant flow of oil into the lagoon, much like solid waste, greatly inhibits the desirability of the RMI as a tourist destination. While numerous violations are issued annually by EPA, there is scant evidence that the number of spills are decreasing. Monitoring of the urban lagoons is necessary to ensure that oil spills are not occurring. The current system of waiting for complaints by concerned citizens can only go so far in finding a solution to the problem, as undoubtedly many of the infractions go unnoticed and unreported. The EPA must seek proactive solutions by working with the marine industries to build spill prevention into their every day work. Finally, the EPA should re-invest some of its violations in oil spill preparedness kits and a program that can be ready in the case of a larger scale emergency.

Management proposals:

- **Action** : The EPA Coastal Management Unit shall assume control of Oil Spill Violations and Inspection, with the assistance of the Water quality and Waste divisions.
- **Recommendation** : More proactive enforcement of oil spill violations by the Attorney general's office by prosecuting cases (this is not currently happening).
- **Recommendation** : Greater outreach to visiting vessels concerning the consequences of oil spills using shipboard agent and EPA inspector.
- **Recommendation** : More financial and institutional support for spill control kits in the RMI—including some readiness at EPA. EPA should be trained in spill control technologies, and have a kit ready for use in the case of emergencies.
- **Recommendation** : Hold meeting with Oil Spill Contingency Plan group to discuss this and other large vessel issues in the increasingly popular Majuro lagoon.

4.4.C Shipwrecks

Status: Every year, a handful of vessels manage to place themselves on the reefs of the RMI. There are several reasons for the navigational difficulty presented in the RMI— incorrect navigational charts, drastically rising shorelines, abandoned vessels and of course human error. Shipwrecks cause significant damage to the coral reef ecosystem by physically shattering corals, spilling oil and scattering debris throughout the near-shore ecosystem. Heavy violations are possible, but there is urgent need to take a more proactive approach concerning the reasons for navigational errors in the RMI.

Management proposals:

- **Recommendation :** Make the correction of the erroneous and outdated nautical charts of the RMI a national priority.
- **Recommendation :** Begin a database of historic shipwrecks around the Marshalls to prioritize locations for navigational beacons (low cost) on highly impacted areas such as Rongrong in Majuro.
- **Recommendation :** Build a workgroup to deal with abandoned vessels in the Marshalls, they are repeatedly ending up on reefs, and no specific person is legally mandated to cover the costs of recovery. If necessary the vessels should be cleaned of oils and toxics and sunk in an environmentally desirable location within or outside the lagoon.
- **Recommendation :** Establish an equitable and standard fining system for the sharing of benefits and simultaneous prosecution of civil and government cases against ship owners that have crashed on privately owned islands.

4.4.D Artificial Reefs

Status: There are numerous artificial reefs through the lagoons of the RMI, most due to military activity in World War II and afterwards. These are generally from war-period airplanes and ships. More recently an increasing number of vessels are being sunk as a means of disposal in the urban lagoons. However, there are no current regulations or oversight that specifically deals with artificial reef generation from sunken objects, bar the earthmoving regulations that at a minimum require permits and EPA approval. Several vested interests are apparent in the sinking of these vessels, including environmental consequences, diving potential and ownership of the vessels once sunk. It is apparent from national law that anything located below the low water mark is part of the public domain, though many would argue that the traditional right has infinite ownership in the lagoon and seaward. Regardless, a simple plan should be developed at the local level to prioritize both where ships are sunk, and what levels of community consultation should be involved in the process.

Management proposals:

- **Action :** Ensure that all toxins, petrochemicals and non-biodegradable waste are removed from vessel prior to sinking and include in guidelines available at the EPA.
- **Recommendation :** Include priority zones for ship sinking in local coastal management plans in consultation with tourism and development interests.

- **Recommendation** : Adequately mark vessels on charts and tourism maps to promote maximum utilization.
- **Recommendation** : Monitor coral recruitment on vessels in various locations to identify where the most suitable locations are for coral recovery.

4.4.E Seaport Activities

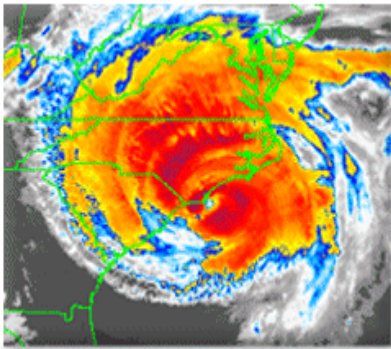
Status: Several major seaports in the RMI represent possible locations for an increase in vulnerability of the coastal zone. Currently there is little environmental oversight of these operations, primarily at two locations in Majuro and one in Ebeye. Undoubtedly seaport renovation and development will continue in the future, and it is recommended that this development utilize careful planning, as well as Environmental Impact Assessment to assure that impacts are minimized to the extent possible.

Management proposals:

- **Action** : Mandate Environmental Impact Assessment for new seaport development activities.
- **Action** : Include seaports on list of inspections for weekly monitoring activities, taking special notice for polluting activities.
- **Recommendation** : Ensure close coordination with Ports Authority and fishing industry regarding seaport activities.

4.5 Natural Threats/Disasters

Nearly every potential natural disaster will have devastating effect on the coastal zone of the urban atolls of the RMI, if not all Atolls. This section covers threats which are long-term,



but of great importance to a country with an average height above sea level of only a few meters. Already on astronomical high tides, water washes over a large number of makeshift residential seawalls. Should a natural disaster coincide with an astronomical high tide, massive flooding will occur throughout the island. Most residences have not been built to withstand typhoons, the impending sea level rise and storm surges that could potentially wipe them out. As well, little coordination and haphazard revetments for coastal protection create many 'leaks' in the barrier between the urban RMI and the

ocean.

4.5.A Sea Level Rise/Climate Change

Status: For the past ten years, the National Tidal Center in Australia has recorded consistently rising sea level in the RMI tidal gauge over the past ten years. Sea level rise scenarios suggest long term planning to prepare over the next 50 years to prepare for anywhere from one (1) to three (3) feet of sea level rise. With many seawalls currently threatened by storms in the current tidal regime, as mean sea level rises, the potential for

large storm events to cause significant damage increases drastically. The Marshalls will not slowly sink, but be increasingly battered by storms that in lower sea levels would not have threatened the coastal defense. The Marshalls have only a few options for adaptation; build up shoreline defenses and elevating structures (only options in urban areas), pushing development and construction away from the coastal zone (still possible in rural areas) and (worst case) evacuation of effected areas.

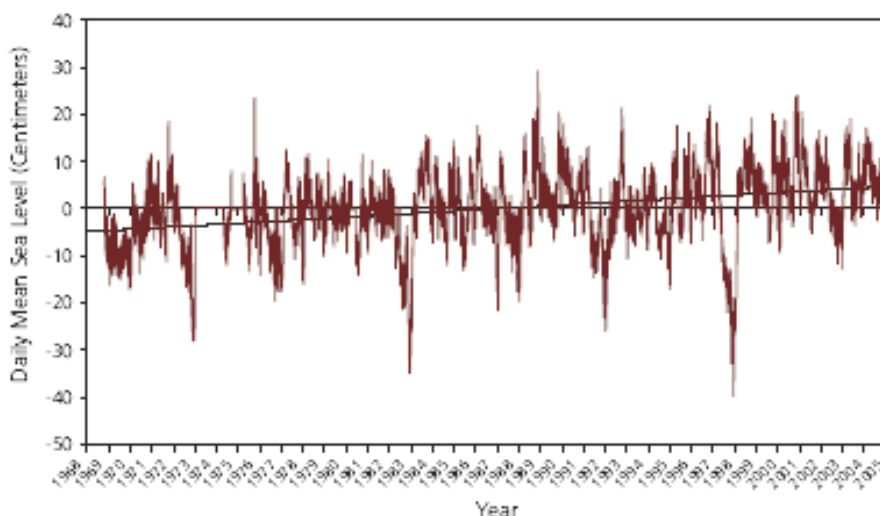


Figure 2: Mean Sea level, Majuro Atoll 1968 - 2005
(source : Asian Development Bank 2005 *Country Environmental Analysis of RMI*)

Management proposals:

- **Action :** Ensure, to the extent possible that large development projects are built to handle the inevitable flooding and higher wave heights facilitated by sea level rise. All houses should consider being built to handle flooding scenarios associated with sea level rise.
- **Action :** Set-backs are crucial for rural areas and outer islands where urban crowding has yet to exist.
- **Recommendation :** The RMI should promote its situation to the world. It must be heard, as it will be one of the first countries to feel the tangible effects of sea level rise on very real terms. This is a key foreign policy issue for the government of the RMI.
- **Recommendation :** A national plan should be initiated to find appropriate funding for a substantial increase in coastal defenses around primarily the urban Atolls.
- **Recommendation :** Aggregate for defense should be extracted in a sustainable fashion, considering that even the current revetments may need considerable enlargement, and the blasting of the reef rock removes essential protection from the near-shore.
- **Recommendation :** A study should evaluate the impact of quarry pools on wave energy as it is transmitted to the shoreline immediately behind the pool. Currently, the only data available is historical observation of long term quarry pits on Majuro and Kwajalein Atolls. Coastal protection in some places is being built with concrete

boulders molded from lagoon sands (this allows for an intact reef flat in front of the protected area.

4.5.B Typhoons and Large Storm Surges.

Status: Though the occurrences are infrequent, the possibility of a full scale typhoon poses the greatest threat to the Republic, which has a physical infrastructure entirely unprepared to handle the associated storm surge and winds. While several houses and buildings are typhoon proof, the vast majority of residences built in especially the poor urban neighborhoods are extremely vulnerable would undoubtedly be washed away in the advent of a full scale storm. With the current status of homes being built only a few feet from crashing ocean waves, coastal planning in the RMI has to date been gambling that no such storm will occur. There does not appear to be an active warning network for weather information, though national radio would surely suffice.

Management proposals:

- **Recommendation :** The same as above, coastal defenses on a massive scale are necessary for the urbanized RMI, and only possible through international funding, as the cost is astronomical. Additionally, current coastal protection in most cases is haphazard and will be unable to withstand increasing wave heights. A great deal of remediation and reconstruction is necessary on these structures.
- **Recommendation :** In the short term, further extension of the shoreline should be carefully considered, as this only increases vulnerability unless it is adequately protected.
- **Recommendation :** Ensure that national radio is capable of broadcasting warning messages for impending disasters.

4.5.C Tsunami

Status: The surrounding bathymetry of the RMI and geographic location allows for the Atoll to escape vulnerability from this very obvious potential threat. Due to the fact that the Atolls are relatively narrow in size and rise sharply from the sea floor, there is little resistance to a passing tidal wave. This section is merely to answer potential questions on tsunamis in the RMI.

Management Proposals:

- **Action :** A study by SOPAC in July of 2006 should confirm the above assumption. Should the study prove otherwise, a reconsideration of this section would be required.

5. COASTAL DATA COLLECTION SYSTEM



Data and long term monitoring are extremely important aspects of the coastal management project to observe long-term positive or negative change in the coastal area. The central data storage for all coastal data, including projects, biological, chemical, physical etc. should be via the ArcGIS based Geographic Information System for ready analysis and display for presentation and analysis of data. Currently coastal data collection is either decentralized, grant driven (sporadically), and minimal if existent. The EPA needs to find low cost solutions for collection of coastal data. While high-tech systems are interesting and powerful tools, they are worthless if the source of income providing for their existence is unsustainable. These funding efforts should be utilized to establish baseline conditions, while low cost science based long term monitoring must provide the evidence via indicators representing those conditions. These data provide powerful tools for decision makers, and are extremely useful in evaluating the utility of the coastal management program in the long run.

5.1 Biological Data

The coral reef ecosystem may be the most surveyed marine ecosystem world-wide and the RMI is no exception. However, as mentioned above, survey teams are not guided by a particular government mandate, nor is their data input into any national system for comparative analysis with locally observed data. The EPA can facilitate through inter-agency marine and coastal groups the collection and sharing of this information as big grant projects come through to engage in surveys in the outer islands. However, in the urban centers of Majuro and Ebeye, quarterly monitoring of long-term sites is recommended for true establishment of the condition of these lagoons. In Jaluit and Wotje (and other outer islands as they come on board) local survey teams can use mask and snorkel to monitor designated near-shore reef and send the data back to the EPA.

5.2 Remotely Sensed Data Management and Analysis

In the past year, a large amount of remotely sensed data has been made available to the RMI EPA via a combination of private interests and international donors. This data has proven invaluable in completing the coastal inventories of Majuro, Jaluit, Wotje and Ebeye. The EPA should maintain an active role in acquiring, maintenance of and analysis associated with satellite imagery and other GIS data products. Currently the RMI GIS User's group is being coordinated by the Coastal Department with definite gains for the EPA, including cost sharing on imagery, equipment loaning from MEC and acquisition of remotely sensed data for in house processing at no cost. Current extent of remotely sensed imagery for the RMI includes the four priority Atolls as well as Arno, Ujae, Utrik and Wotho. Several purchases are eminent via the USDA and SOPAC for large areas of the RMI territory.

5.3 Coastal Geological Data

In the late 1990s several long term shoreline monitoring stations were established in Majuro. These stations should become part of the quarterly data collection recommended for the RMI EPA. In combination with long-term aerial photograph and satellite imagery analysis, EPA can successfully monitor erosion or accretion of the shoreline of the RMI. This data collection should be expanded to include the other three prioritized Atolls and included in the GIS data management system.

5.4 Coastal Pollution

While the problem of coastal pollution is ubiquitous in the RMI, there is little monitoring of shoreline conditions to understand the extent of the physical garbage. It is recommended that in order to measure future gains in this area, the EPA initiate quarterly surveys of designated sites for beach pollution. The data again can be input into the spatial data base, should be made public via the radio and newspaper and act as a metric by which the EPA and RMI can measure its handling of solid waste.

5.5 Permitting and Violation Data Collection

All environmental permits and violations should be constantly updated in electronic version via a GIS database. The resulting dataset can be utilized for simple reporting, and as a way to analyze the impacts of various development projects. This system is currently in place for Earthmoving permits, both major and minor, but not other permits and violations in general.

5.6 Social Data Collection.

Periodically the EPA should conduct social awareness surveys that assess both environmental attitude and related behavior to the coastal issues identified in this report. Surveys have been conducted in Majuro and some outer islands for the purposes of developing local management plans.

6. EDUCATION AND OUTREACH



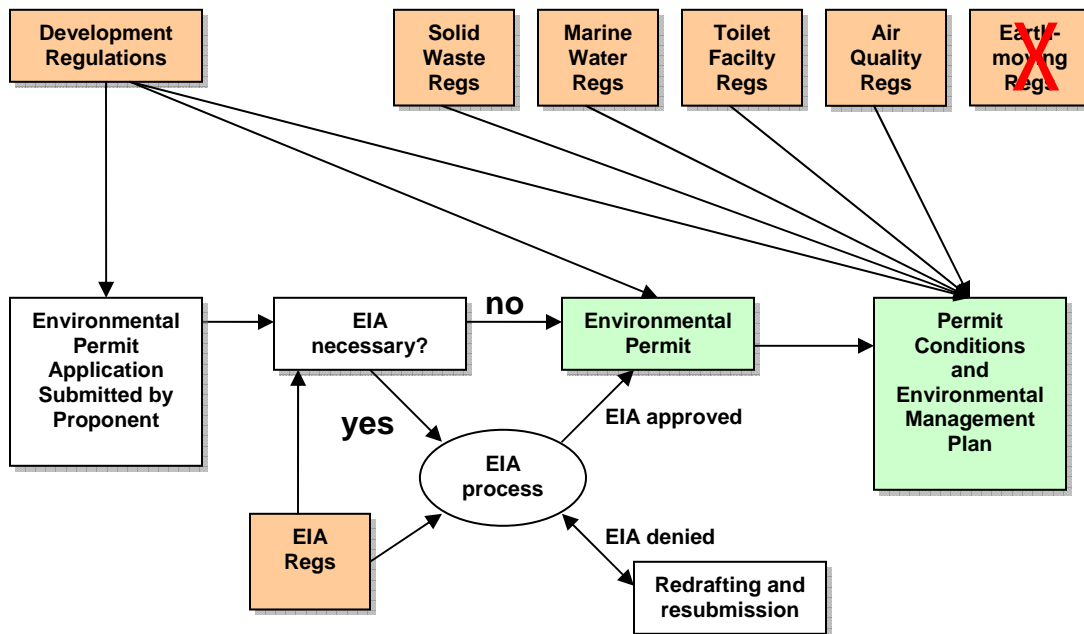
Outreach is an extremely important component of the successful fulfillment of many of the actions and recommendations in this Framework. Varieties of tools already exist and are available to the EPA to assist with this large challenge. It is important that the outreach component is consistent and clear, for an extended period of time (not simply one or two months). The coastal department must actively engage the outreach and education department to develop a continuous message utilizing the proposed means below. The RMI EPA must also rely heavily on local government, NGOs, community partners and traditional and community leaders for the outreach and promotion of the topics covered in this framework. Key avenues are proposed for the outreach campaign:

- **Newspaper** An important tool for awareness of environmental regulations and legal documents, however, the newspaper is not seen as a primary tool for educating people on a consistent basis due to its costs and limited readership on Majuro Atoll. Currently an Advertisement has been placed raising awareness of earthmoving regulations, this shall continue on a monthly basis, to bring compliance of EPA regulations to 100%. Additionally, EIA advertisements must continue utilizing the newspaper.
- **Radio** THE primary means by which the coastal message can be sent to the entire RMI, including all above and much more. A variety of possibilities exist, including radio spots, the EPA radio show, radio dramas and comedy and songs. Additionally, pertinent events and environmental situations can be reported via the radio.
- **Web-based** International promotion of the EPA Coastal program and associated regulations necessary for international firms conducting development projects in the RMI.
- **Educational Presentations** by the EPA Education and Awareness Office for students and adults alike on coastal issues as they arise, including, but not limited to:
 - Coastal erosion and seawall construction.
 - Elimination of Plastics from private landfills.
 - Coral Reef Health and importance.
 - Oil spill prevention and awareness.
 - Toilet and Sewer systems
- **Coordination** with Government Ministries, NGOs, local schools to build alternative awareness raising activities for coastal quality including:
 - Songs
 - Plays
 - Posters
 - DVDs or videos

7. LEGAL MANAGEMENT OPPORTUNITIES

The vast majority of this report involves not regulatory, but participatory solutions. However, the EPA must maintain its central role in the coastal area as an enforcer of relevant environmental law. The track record of EPA enforcement however, has not created a great deal of change in behavior in the coastal realm and the hope of this program is to provide improved incentives for this shift. As such, regulations and the potential of violations are a must for the campaign to be successful. However, this should not remain THE ONLY tool of the EPA, it should be an option of last resort, and should be triggered in a systematic and objective manner.

Currently, the EPA has many regulatory instruments to deal with coastal degradation issues, however, for a variety of reasons, the ability for EPA to enforce these regulations is difficult. This difficulty stems from lack of assistance to legally prosecute violations, an incomplete regulatory framework, the current scale of violations existing in Majuro, and the difficulty of enforcement in Outer Islands. For this reason, a simplified EPA regulatory system is proposed, integrating coastal regulations, simplifying procedures for applicants, and updating the regulatory framework. Under the previous regulatory scheme, a variety of permits were issued for a variety of projects, including toilets, septic systems, outfalls, solid waste facilities, earthmoving projects, and for major projects, Environmental Impact Assessments. This framework has left several gaps including air quality standards, impacts of marine activities and other developments that are not required to have permits under the current regime. What is proposed is the integration of all coastal related regulations into a single “Environmental Permit”, while the standards and legal requirements are stored in separate regulatory instruments that evolve from the current regulations. The proposal is best depicted in the following schematic:



Within the EPA, the coastal department will be in charge of processing all permit applications, pending review by other departments and eventual approval or denial by the General Manager. Compliance with the various regulatory instruments shall continue to be coordinated through the EPA Compliance Task Force. Monitoring and enforcement of permit conditions will continue to be enforced by the coastal department. This recommendation could only come into effect by amending the various regulatory instruments, such as water quality, solid waste etc. that would feed into the permit system, these reviews are recommended below.

7.1 Environmental Impact Assessment Regulations

The RMI EIA regulations have gone through a major implementation phase in the past year. In total, six EIA procedures have been completed, and another five are on their way. Not without criticism, the central feedback the EPA has received is that it is not being strong enough, and that the EIA procedures should start earlier in the development project process. This is an excellent sign for the EPA that the tool can remain a vital tool for project management in the RMI. Of high importance is that the RMI EPA General Manager or a representative is included on all major project management or bid committees. This way, information concerning potential project impacts, and their management and regulatory requirements can be disseminated as early as possible. It is estimated that the EPA should be prepared for anywhere from four to ten EIAs in any given year as long as current compact and international funding allows for the push in infrastructure development that is currently driving construction on island.

The EPA does have considerable problems concerning the effective evaluation of the highly technical components of EIAs. For this problem, it is recommended that the EPA utilize its long-term partners for free feedback on the scientific content in all future Environmental Impact Assessments. Three organizations are suggested as recipients of EIAs in the future for analysis and feedback, SOPAC, USEPA Region 9 Pacific Islands Office and SPREP. As well, it is recommended that EPA continue to keep an outside Environmental Advisor on staff to coordinate, among other things EIAs especially with international applications and companies.

Finally, there is recognition that projects of different sizes (both physically and financially) all may trigger the EIA process. For this reason, the EPA must remain highly flexible so that even small projects (with potentially big impacts) can be incorporated into the EIA process. While the new sustainable *Development Regulations* do allow for the utilization of Environmental Management Plans for managing projects that are routine, and all impacts are known. Most likely, new developments for tourism, dredging, major construction, industrial development etc. will require a completed EIA process. The EPA must continue to work with developers to assure that the process is realistic for the size of their project, and thus the success of the program will continue.

7.2 Earthmoving Regulations

It is proposed that these regulations be super-ceded by the proposed Sustainable Development Regulations that are currently being reviewed and awaiting approval by the RMI EPA Board. Though a highly effective tool to manage some development projects, there are serious loopholes in permit fee language, many coastal activities cannot be

adequately regulated, and environmental management is not as flexible as is necessary given the current permit system. This said, a complete review of the current status of these regulations is not included in this survey

7.3 EPA Development Regulations

The proposed development regulations suggest a new permit system that covers, among other things a fixed permit fee for three tiers of projects, broader regulatory power than the previous Earthmoving permits, exceptions for outer islands residential projects outside of the coastal zone, several activities that are to be phased out, including lagoon side dredging and private land-fills, and the implementation of Environmental Management Plans (EMP) for projects that are major but do not require a full EIA. These EMPs will allow for EPA to work in consultation with the project applicants to predict major and minor environmental problems and hopefully avoid any unnecessary damage. These regulations are required by the Coast Conservation Act, and are intended to super-cede earthmoving regulations to avoid redundancy. Additionally, these regulations will act as the central instrument for permitting environmental activities that impact the natural environment of the RMI.

7.4 Marine Water Quality Regulations

Currently a review of these regulations is being carried out between the Coastal and Water Quality department of the EPA. This review, part and parcel of the EPA's Coastal Management program, should result in a new set of revised regulations that utilize the above *EPA Development Regulations* for permitting procedures, as well as a revised program for monitoring marine water.

7.5 Toilet and Sewer Facility Regulations

As has been identified in a previous section, these regulations must be adequately enforced by the RMI EPA. No new septic systems should be allowed in the DUD or Ebeye area, where public sewer systems are available. The regulations shall be revised to allow for centralized permitting through the *EPA Development Regulations*.

7.6 Solid Waste Regulations

A review of these regulations and their enforcement is suggested in order to effectively begin to handle the solid waste situation as it relates to coastal issues. This should be conducted independent of this project and be prioritized by the RMI EPA. Specifically these regulations should, among other things, severely restrict private landfills, encourage incineration, and require by law recycling, composting and waste reduction programs by private sector. These regulations should continue to require an Environmental Impact Assessment, and issue permits under the *EPA Development Regulations*. Private landfills should in the coastal zone should be held to the same standards as public landfills (which need to be greatly increased.)

7.7 EPA Fining System and Legal Recourse

The current EPA fining system for both environmental damage and infractions of regulatory procedure is both haphazard and unequally enforced. This is partially because the EPA allows violators to bargain down their violation fee based on their explanation of the violation. This creates a significant problem with EPA of unpaid fines, unequal enforcement and associated inequitable treatment. EPA needs a clear, fixed and transparent system for handling minor coastal infractions. While incidents involving major environmental fines should remain subject to the judgment of the courts or General Manger, smaller and more routine fines need a public and judicial system for allocating fines.

Additionally, as of the printing of this Plan, there has not been a single prosecution by the Attorney General’s Office of any outstanding violation under EPA regulations (of which there are currently over forty. This lack of legal recourse has rendered much of the EPA regulatory stick useless and resulted in much of the environmental degradation that exists in Majuro and the RMI today. A system has recently been proposed by the Attorney General’s office to build legal action into the fining system by mandating that in the advent of a violation, the party would have 14 days to pay the EPA, or seek recourse in the courts. Any failure to pay or seek legal remedy would result in an additional civil infraction.

Table 3: Example of potential EPA fining system

Activity	1 st Instance	2 nd Instance	3 rd Instance	Continued
Development w/o permit	\$100.00	\$500.00	\$1000.00	Increase by \$1,000 to 10,000
Permit condition violation	warning	\$200.00	\$500.00	\$1,000.00 plus cease and desist
Oil Spill (minor)	\$500.00	\$1000.00	\$2500.00	\$5,000 plus court action
EIA condition violation	warning	\$500.00	\$1000.00	\$5,000.00 plus cease and desist

7.8 Local Coastal Management Programs

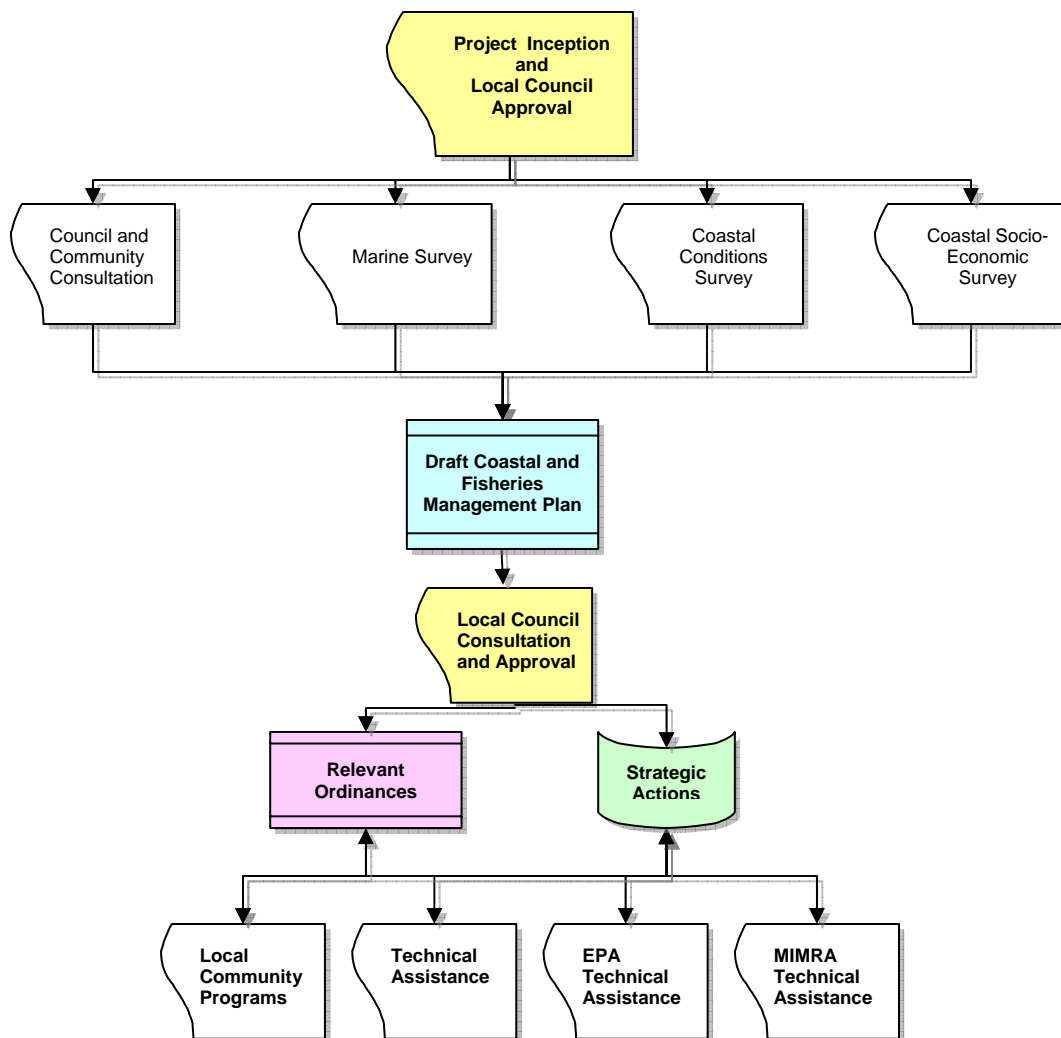
The RMI EPA has already commenced discussion with local governments to draft local Coastal Management Programs. These programs should start with small projects that are conducted jointly with EPA support, and then can expand over time. The following are suggestions for projects under local government coastal management programs:

- Draft zoning maps to be utilized for planning decisions and EPA environmental permitting, then later incorporated into local ordinances or planning. These maps should at a minimum divide atolls into the following areas fro the requirements of the CCA §307(1)(c):
 - Residential
 - Conservation
 - Recreational

- Agricultural/Copra
 - Industrial
 - Seaport
 - Commercial
 - Government Development
- Solid Waste reduction, recycling and composting projects.
 - Coastal Clean-up projects.
 - Human and animal waste law enforcement and education.
 - Empowerment of local governments to be in close contact with EPA Coastal Office concerning major development projects and general environmental concerns.

Local government coastal management projects will be supported fully by the Coastal Management Office. Successful adoption of projects supported by local governments will contribute significantly to the sustainability of the EPA's Coastal Program.

Coordination with the multi-agency marine and coastal group programs and MIMRA's coastal fisheries program is necessary for the successful implementation of the local coastal management plans. Each of the four target Atolls has a separate situation and must be addressed accordingly, however, the following outline briefly describes the general process:



In each of the priority atolls, pre-existing conditions exist. For this reason the following table helps to explain the path forward for each Atoll:

In **Majuro**, MIMRA has previously conducted numerous community workshops on coastal issues focused on fisheries management. However, in these meetings numerous overlapping EPA issues were raised, including dredging, solid waste, coral conservation, erosion etc. An existing MIMRA Fisheries Management Plan already covers these issues, albeit briefly, and is awaiting approval by MalGov. The EPA has already met twice with the executive committee of the local government and plans to integrate the Majuro Coastal Plan with the existing MIMRA fisheries plan, for an institutionally integrated ecosystem based management plan for the Atoll.

On **Kwajalein** and **Wotje**, preliminary meetings with the mayor and local council have gathered that the Atolls are individually interested in an integrated approach to coastal management. Shortly, EPA staff from Ebeye will be trained to conduct community meetings and household surveys on coastal issues. On Wotje, during early July of 2006 a inter-organizational team conducted community workshops and household surveys as well as preliminary meetings with the council and mayor. Once the preliminary data has been gathered from these surveys on Wotje and Kwajalein, a draft management plan will be forwarded to the local councils for consideration.

On **Jaluit**, the Jaluit Atoll Conservation Project (JACE) has already built a comprehensive living resource management plan that is awaiting approval by the local council. This is currently problematic given that the local government has been dissolved by the Ministry of Internal Affairs. However, the EPA will utilize JACA staff to assist in community workshops and household surveys to build the basis for an addendum to the JACA proposal that incorporates a full ecosystem approach to coastal and fisheries management on Jaluit Atoll. Once a council is again in place, then the EPA will be able to provide the complete proposal for approval.

8. INSTITUTIONAL ARRANGEMENTS

CMI – The central strength of the College of the Marshall Islands is the human resources it brings to the country. With strong Marine Science and Agricultural departments, much technical knowledge about environmental processes can be attained from this key partner. As well, CMI is an essential resource for providing capable individuals that can conduct Environmental Impact Assessments and coral reef monitoring and surveys.

EPPSO – The Economic Policy, Planning and Statistics Office has in its mandate to develop local planning programs if local governments do not, according to the Planning and Zoning Act. Local planning ordinances would greatly improve coastal quality in the RMI.

GIS User's Group – A small group of GIS User's on Majuro have started this group to collaborate in data collection, training and knowledge exchange. EPA's Coastal Division has served as the essential secretariat for this organization over the past year.

Historic Preservation Office and Allele Museum – Coordination with these offices shall continue for all permitting projects. Importantly, any major development that is considered for EIA should be vetted through the HPO office.

MICS and other NGOs – The EPA Coastal department will support any mutually beneficial efforts from the emerging environmental civil society in the RMI. Support can range from technical assistance, GIS mapping, cooperation for data collection etc.

MIMRA – The benefits of this program represent large gains for MIRA coastal fisheries projects. As has been identified in earlier pages, MIMRA is vital to the successful environmental oversight and sustainability of marine operations

MIVA – Sustainable and clean coasts have been established as a priority for the Visitor's Authority, going hand in hand with successful tourism development in the RMI. MIVA is a strong partner for coastal clean-up campaigns, and has demonstrated effectiveness in greatly improving the situation with littered trash Majuro's DUD area.

OEPPC – As the central agency for programming international environmental treaties and resulting funding, OEEPC should endorse this plan and assist EPA in finding funding partners and possibilities to ensure the programs long-term sustainability.

Private Sector – It is crucial that the partnership between the EPA and private sector construction firms and citizens of the RMI continues. This dialogue should be on a constant basis throughout the project cycle as well as while new policies and programs are considered. The private construction sector is vital to the economy and development of the RMI, and must be viewed as a primary partner for coastal management.

9. FUNDING POSSIBILITIES AND EXTERNAL ASSISTANCE

External funding has historically provided a large portion of the EPA budget. The US Compact of Free Association notably provided in FY2005 over \$400,000 to the EPA. It is vital that funding on this scale continue for the RMI EPA, either through the Compact or directly from the central government. Beyond this, many grant driven projects have been initiated at EPA over the years. Many of these projects have resulted in unsustainable and highly technical results. Funding opportunities for the Coastal division should focus on outputs that can be directly utilized by the staff at the EPA. As well, funding efforts should provide outputs that can last long after the funding has been exhausted. This said, there will undoubtedly continue to be a large volume of funding available for coastal issues in the RMI. Elements of this plan that would require external assistance have been highlighted in the appendix. Funded projects should not disrupt the day to day operations of the department that can be funded through the annual budget and the revenue from permits and fines. This said the following entities should be potential external contacts for coastal funding or technical assistance in the future:

- **US Department of Interior**
- **US EPA Region 9**
- **South Pacific Regional Applied Geoscience Commission**
- **South Pacific Regional Environmental Program**
- **US National Oceanographic and Atmospheric Administration**
- **Global Environment Facility – Desertification Convention**
- **Global Environment Facility - Convention on Biological Diversity**
- **Global Environment Facility - International Waters Project**
- **ADB Solid Waste Technical Assistance Project**

10. CONCLUSION

This Framework provides an action plan for the RMI on many issues that impact the coast. As a low elevation nation, the population of the Marshalls feels the impact of the ocean and environmental problems on their shores more than most nations. It is vital that the RMI at a national level continue to pursue the mission that has been initiated with the signing of the Coast Conservation Act of 1988. It is recommended that the plan be considered by all relevant government Ministries and an agenda for improvement of the coastal zone be adopted by each relevant ministry or regulatory authority. The EPA which currently houses the Coastal Program will continue to coordinate actions, meetings and projects per this Framework, and will review annually to assess its success or failure. With a renewed commitment to the importance of a successful coastal management program, , the coasts of the RMI will be secure from erosion, clean from trash, healthy for its children and attractive for foreign investors and visitors.

Given that there is currently no National Environmental Council, this Plan will be on display for public comment until June 16, 2006, after which a revised final plan will be submitted to Cabinet through the Minister in Assistance to the President for final adoption and approval, per CCA §304(4).

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